MYCOTAXON

Volume 109, pp. 165–170 *July–September 2009*

Umbilicaria isidiosa (lichenized *Ascomycota*), a new species from Bolivia

Beata Krzewicka & Karina Wilk

b.krzewicka@botany.pl & k.wilk@botany.pl

Laboratory of Lichenology, W. Szafer Institute of Botany Polish Academy of Sciences Lubicz 46, Kraków PL-31-512 Poland

Abstract — *Umbilicaria isidiosa*, a new species from Bolivia, is described. It is characterized by the ashy brown to mouse grey, pruinose, smooth to slightly scabrous upper surface of its thallus with numerous globular to richly branched isidia clustered at its margin, and a lower surface that is blackish and smooth to scabrous with sparse, blackish rhizines.

Key words — taxonomy, new records, South America

Introduction

The lichen genus *Umbilicaria* Hoffm. currently comprises more than 90 accepted species, which are widely distributed, especially in polar and mountainous regions. Although species are relatively well-known since the monographs by Frey (1933) and Llano (1950), some new species are still being discovered, such as *U. subcalvescens* Sipman from Colombia (Sipman & Topham 1992), *U. pseudocinerascens* J.C. Wei & Y.M. Jiang and *U. loboperipherica* J.C. Wei et al. from China (Wei & Jiang 1988, Wei et al. 1996), *U. kappenii* Sancho et al. from Antarctica (Sancho et al. 1998) and *U. murihikuana* D.J. Galloway & Sancho from New Zealand (Galloway & Sancho 2005).

The lichen biota of South America have more recently proved of special interest and extensive investigations have been conducted there (see Marcelli & Seaward 1998 for a summary); Feuerer et al. (1998), who cited only 210 known species in Bolivia, estimated there might be up to 2500 species in the country. During the last ten years, intensive fieldwork carried out in Latin America, including Bolivia, has resulted in many new species and records (e.g. Ferraro 2002, Feuerer & Sipman 2005, Galloway 2005, Flakus & Wilk 2006, Flakus et al. 2006, Flakus & Kukwa 2007, Flakus & Lücking 2008, Knudsen et al. 2008). As regards the family *Umbilicariaceae,* Hestmark (1997) started collecting data

in 1994 in anticipation of a contribution to the Flora Neotropica monographs (G. Hestmark, in litt.).

The lichenological investigations carried out in Bolivia in 2004 by Polish lichenologists resulted in the collection of some very interesting specimens of *Umbilicaria* (as many as 16 taxa, Krzewicka & Flakus, in press), including *U. isidiosa,* a new species described here.

Materials and methods

Lichen material from KRAM, LPB and M herbaria was examined using standard microscopic techniques. All measurements were made in 5% KOH solution. Thin layer chromatography (TLC) was performed in solvent A (Orange et al. 2001).

Taxonomic description

Umbilicaria isidiosa Krzewicka, **sp. nov.** PLATE 1

MYCOBANK 513413

Thallus monophyllus, umbilicatus, orbiculatus vel irregularis, 1–4(–5) cm diametro, margine saepe incise-lobatus. Superficies superior laevis vel tenuiter scabrida, cinerea, pruinosa. Superficies inferior nigra vel fuliginosa, exasperata vel areolato-scabrida. Thalloconidia absens. Isidia obscura fusca, globosa vel ramose, aggregata ad margine, 50 × 50–100 µm diam.

TYPE: BOLIVIA, DEPARTMENT SANTA CRUZ, Province of Manuel Maria Caballero, East Cordillera, NW of Comarapa city, Siberia village, 3480 m a.s.l., (64°45'14"W 17°49'38"S) on sandstone in open area, 15 December 2004, A. Flakus *5696* (KRAM-L 53288 – holotype; LPB, herb. Flakus – isotypes).

DESCRIPTION – Thallus foliose, umbilicate, thick, rigid, monophyllous, rarely polyphyllous, orbicular to irregular, 1–4(–5) cm in diam. Margin shallow incised, lacerate and undulate, covered by dark brown isidia. Upper surface dull, more or less uniformly coloured, ashy brown or mouse grey, pruinose, smooth to slightly scabrous, plane, without pustules. Lower surface minutely roughened to markedly areolate-scabrid, without trabecules, black, towards the margin paler, dark brown or medium brown. Rhizines very rare present, occasional, simple, cylindrical, dark brown to black, at or near margins. Umbilicus short, black, compact, asymmetric. Isidia clustered on upper surface at margin, rarely scattered through upper surface and on lower cortex of curled up lobes, glossy, dark brown to blackish, coralloid or densely branched, globular to cylindrical, 50 × 50–100 µm diam. Thalloconidia absent. Apothecia not observed.

Thallus up to 180–300 µm thick. Upper cortex two-layered: epinecral layer up to 20–25 µm thick, discontinuous, eroded and paraplectenchymatous layer, up to 30–40 µm thick, brown pigmented in upper part. Algal layer 30–40(–80) µm thick, more or less continuous, algal cells up to 8–10 × 8–10 µm in diam. not aggregated. Medulla prosopectenchymatous, up to 80–110 µm thick, one

layered, composed of loosely interwoven, mainly horizontally oriented hyphae, with many intercellular air spaces, havaasii type (Valladares & Sancho 1995). Lower cortex up to 20–40(–60) μm thick, dark brown, paraplectenchymatous.

Chemistry – gyrophoric acid detected by TLC.

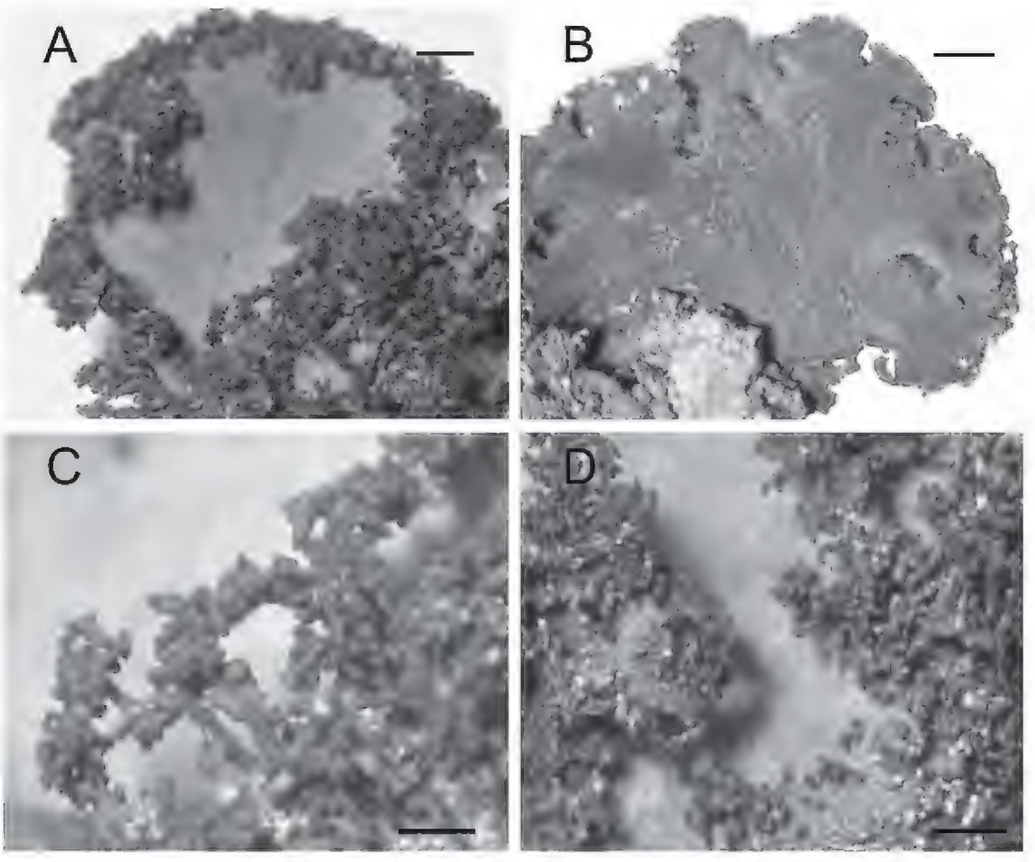

Plate 1. *Umbilicaria isidiosa* (holotype).
A – upper surface; B – lower surface; C – isidia at margin; D – isidia on upper surface.
Scale bar A–B = 1mm, C = 0.2 mm, D = 0.5 mm.

Ecology and distribution – *Umbilicaria isidiosa* occurs on siliceous sandstones in exposed, sunny, windy, and humid places; the humidity results from periodic fogs. It grows on large blocks of rock up to 1 m in height scattered over an agriculture area at the fringes of the Yungas cloud forest. It is accompanied by *Aspicilia*, *Caloplaca*, *Rhizocarpon* and *Usnea* spp. Other *Umbilicaria* species were not observed in the area investigated. This new species is known only from the type locality in the Bolivian Andes on the East Cordillera, on the slope of hill above Siberia village at 3480 m a.s.l., where it appears to be quite abundant.

Additional specimen examined – BOLIVIA, Department Santa Cruz, Province of Manuel Maria Caballero, East Cordillera, NW of Comarapa city, on hill above Siberia village, 3480 m a.s.l., (64°45'14"W 17°49'38"S) on sandstone, in open, sunny area, 15 December 2004, K. Wilk *3098b* (KRAM-L 53289).

Comments – Vegetative propagules are excellent diagnostic characters for several species, e.g. soredia for *U. kappenii* and *U. soralifera* (Frey) Krog & Swinscow, parasoredia for *U. grisea* Hoffm. and *U. hirsuta* (Westr.) Hoffm., schizidia for *U. freyi* Codogno et al. and *U. leprosa* (Zahlbr.) Frey, and squamose lobules for *U. loboperipherica* and *U. thamnodes* Hue (Frey 1949, Codogno et al. 1989, Wei et al. 1996, Sancho et al. 1998). The only *Umbilicaria* species producing true isidia is *U. deusta* (L.) Baumg., which is easily distinguished from *U. isidiosa* by its very thin and fragile thallus with a medium to dark brown, smooth to slightly wrinkled upper surface and pale to dark brown (rarely black) pitted lower surface without rhizines (Krzewicka 2004). Moreover, in *U. deusta* the isidia are concolorous with the upper cortex, i.e. brown to dark brown, minute, granular, occurring mainly along cracks and abrasions through the upper surface, whereas in *U. isidiosa* the isidia are distinctly darker than the upper cortex, dark brown to blackish, coralloid, densely branched, globular to cylindrical, clustered on upper surface at margin, rarely scattered throughout the upper surface. The isidia of *U. isidiosa* also occur on the lower cortex of the curled up lobes, which has never been observed in the case of *U. deusta*.

Furthermore, the species appear to differ in their world distribution. *Umbilicaria deusta* is a circumboreal-montane species occurring mainly in the Northern Hemisphere where it is one of the most frequent species of this genus (Llano 1950). Recently, it has been also reported from South America (Hestmark 2004) and from New Zealand (Galloway & Ledingham 2006). However, *U. isidiosa* is currently known from only a small area in the Bolivian Andes.

Owing to the marginal dark brown, multi-divided isidia (Plate 1), giving a ciliate appearance to the thallus, *U. isidiosa* could be confused with *U. dendrophora* (Poelt) Hestmark, a taxon occurring in South America (Hestmark 1997) or *U. umbilicarioides* (Stein) Krog & Swinscow, a taxon widespread in Antarctic region (Øvstedal & Lewis Smith 2001, Krzewicka & Smykla 2004) which create rhizines bearing multi-cellular thalloconidia at their thallial margins (Krog & Swinscow 1986, Hestmark 1990, 1993). By careful study, one can easily recognize these taxa by their asexual propagules. *Umbilicaria umbilicarioides* and *U. dendrophora* are distinguished from the new species by the presence of multi-cellular thalloconidia on rhizines, whereas *U isidiosa* lacks thalloconidia but produces isidia. An additional distinguishing character is the abundance of richly branched rhizines in the case of *U. umbilicarioides* and *U. dendrophora*, but these are sparse and simple in *U. isidiosa*.

Acknowledgements

We would like to thank Prof. Mark R. D. Seaward and Prof. Leopoldo G. Sancho for reviewing the manuscript prior to submission. We are grateful to Dr. Stephan G. Beck

and Mrs Rosa Isela Moneses (La Paz, Herbario Nacional de Bolivia, Instituto de Ecología, Universidad Mayor de San Andrés) for generous collaboration and to Prof. Zbigniew Mirek, the Director of the Institute of Botany PAS (Kraków, Poland) for supporting lichenological study in South America. Thanks are also due to the curators of the lichen herbaria KRAM, LPB and M for their valuable help.

Literature cited

Codogno M, Poelt J, Puntillo D. 1989. *Umbilicaria freyi* spec. nov. und der Formenkreis von *Umbilicaria hirsuta* in Europa (Lichenes, *Umbilicariaceae*). Plant Systematics and Evolution 165: 55-69.

Ferraro LI. 2002. Contribution to the knowledge of foliiocolous lichens of Bolivia. Mitteilungen aus dem Institut für allgemeine Botanik in Hamburg 30-32: 47-48.

Feuerer T, Sipman HJM. 2005. Additions to the lichenized and lichenicolous fungi of Bolivia. Herzogia 18: 139-144.

Feuerer T, Ahti T, Vitikainen O. 1998. Lichenological investigations in Bolivia. 71-86, in MP Marcelli, MRD Seaward (eds.), Lichenology in Latin America: history, current knowledge and applications. São Paulo, CETESB.

Flakus A, Kukwa M. 2007. New species and records of *Lepraria* (*Stereocaulaceae*, lichenized *Ascomycota*) from South America. Lichenologist 39: 463-474.

Flakus A, Kukwa M, Czarnota P. 2006. Some interesting records of lichenized and lichenicolous *Ascomycota* from South America. Polish Botanical Journal 51: 209-215.

Flakus A, Lücking R. 2008. New species and additional records of foliicolous lichenized fungi from Bolivia. Lichenologist 40: 423-436.

Flakus A, Wilk K. 2006. Contribution to the knowledge of the lichen biota of Bolivia. Journal of the **Hattori** Botanical **Laboratory** 99: 307-318.

Frey E. 1933. *Cladoniaceae, Umbilicariaceae.* In: Rabenhorst's Kryptogamen-Flora von Deutschland, Österreich und der Schweiz. 4: 203-411. Leipzig, Akademische Verlagsgesellschaft M.B.H.

Frey E. 1949. Neue Beitrage zu einer Monographie des Genus *Umbilicaria* Hoffm. Bericht der Schweizerischen Botanischen Gesellschaft. Bulletin de la Société Botanique Suisse 59: 427-470.

Galloway DJ. 2005. *Placopsis fusciduloides* (*Ascomycota*: *Agyriaceae*), a new lichen from Aotearoa New Zealand, British Columbia, and Bolivia. Australasian Lichenology 57: 16-19.

Galloway DJ, Sancho LG. 2005. *Umbilicaria murihikuana* and *U. robusta* (*Umbilicariaceae*: *Ascomycota*), two new taxa from Aotearoa New Zealand. Australasian Lichenology 56: 16-19.

Galloway DJ, Ledingham J. 2006. Additional lichen records from New Zealand 43. *Umbilicaria deusta* (L.) Baumg. Australasian Lichenology 58: 14-16.

Hestmark G. 1990. Thalloconidia in the genus *Umbilicaria*. Nordic Journal of Botany 9: 547-574.

Hestmark G. 1993. *Umbilicaria dendrophora*. Mycotaxon 46: 211-215.

Hestmark G. 1997. Species diversity and reproductive strategies in the family *Umbilicariaceae* on high equatorial mountains – with remarks on global patterns. Bibliotheca Lichenologica 68: 195-202.

Hestmark G. 2004. *Umbilicaria*. 548-556, in TH Nash III, BD Ryan, P Diederich, C Gries, F Bungartz (eds.), Lichen Flora of the Greater Sonoran Desert Region. II. Tempe, Arizona, Lichens Unlimited, Arizona State University.

Knudsen K, Elix JA, Reeb V. 2008. A preliminary study of the genera *Acarospora* and *Pleopsidium* in South America. Opuscula Philolochenum 5: 1-22.

Krog H, Swinscow TDV. 1986. The lichen genera *Lasallia* and *Umbilicaria* in East Africa. Nordic Journal of Botany 6: 75-85.

Krzewicka B. 2004. The lichen genera *Lasallia* and *Umbilicaria* in the Polish Tatra Mts. Polish Botanical Studies 17: 1-88.

Krzewicka B, Smykla J. 2004. The lichen genus *Umbilicaria* from the neighbourhood of Admiralty Bay (King George Island, maritime Antarctic), with a proposed new key to all Antarctic taxa. Polar Biology 28: 15-25.

Llano GA. 1950. A Monograph of the Lichen Family *Umbilicariaceae* in the Western Hemisphere. Washington, D.C., Office of Naval Research.

Marcelli MP, Seaward MRD (eds.). 1998. Lichenology in Latin America: history, current knowledge and applications. São Paulo, CETESB.

Orange A, James PW, White FJ. 2001. Microchemical methods for the identification of lichens. London, British Lichen Society.

Øvstedal DO, Lewis Smith RI. 2001. Lichens of Antarctica and South Georgia. A Guide to their Identification and Ecology. Cambridge, Cambridge University Press.

Sancho LG, Schroeter B, Valladares F. 1998. *Umbilicaria kappeni* (*Umbilicariaceae*) a new lichen species from Antarctica with multiple mechanisms for the simultaneous dispersal of both symbionts. Nova Hedwigia 67: 279-288.

Sipman HJM, Topham P. 1992. The genus *Umbilicaria* (lichenized ascomycetes) in Colombia. Nova Hedwigia 54: 63-75.

Valladares F, Sancho LG. 1995. Medullary structure of *Umbilicariaceae*. Lichenologist 27: 189-199.

Wei J, Jiang, Y. 1988. A conspectus of the lichenized *Ascomycetes*. *Umbilicariaceae* in China. Mycosystema 1: 73-106.

Wei J, Jiang Y, Guo S. 1996. A new species of *Umbilicaria*. Mycosystema 8-9: 65-70.